

Towards Genome-Wide Association Mapping in apple (*Malus × domestica*)

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The Institute for Breeding Research on Fruit Crops in Pillnitz, Dresden is not only a node in the decentralised network of German Fruit Genebank (Deutsche Genbank Obst) but also responsible for coordinating the work between different partners. The institutional Fruit Genebank has an incredibly diverse ex-situ collection of domesticated apples (*Malus × domestica*) comprising of 702 cultivars. The oldest cultivar in the collection dates back to the 12th century. These cultivars, along with accessions of wild apple species (*Malus sylvestris*, *Malus floribunda*, etc.) provide a fundamental resource for genetic research and fruit breeding.

This extensive field collection of *Malus* germplasm, although critical for crop improvement, are expensive to maintain and can be unwieldy for research purposes. To improve this situation, Sir Otto Frankel introduced the concept of “Core Collection” in 1984. “Core” is the essential part of the entire collection and is defined as “a limited set of accessions which represents, with a minimum of repeti-

tiveness, the genetic diversity of a crop species and its wild relatives”.

This idea was applied to the apple germplasm collection of the institutional Fruit Genebank. All cultivars were genotyped using 17 SSR markers. The triploids were carefully removed, and the data was fed to different software programs. Finally, a collection of 113 cultivars was selected by PowerCore. Later a ‘Mixed Approach (software findings + expert opinion)’ proposed by Urrestarazau (2019) was adopted and 42 cultivars were integrated to this collection. Ultimately, a “Core Collection” with 155 cultivars was established.

After the successful establishment of the Core Collection, the next step was scoring the phenological events and phenotyping of the cultivars. The future goal will be the Genome-Wide Association Mapping studies to compare the DNA of the plants having varying phenotypes for essential traits like very early and late bud burst etc.